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SEQUENCE LISTING

<110> Hexima Limited
La Trobe University
Dunse, Kerry, Michelle (US ONLY)
Heath, Robyn, Louise (US ONLY)
Anderson, Marilyn, Anne (US ONLY)

<120> Novel insect enzymes and inhibitors thereof

<130> 12440340/EJH

<150> US 60/465,054
<151> 2003-04-23

<160> 93

<170> PatentIn version 3.1

<210> 1
<211> 5
<212> PRT
<213> peptide

<400> 1

Glu Glu Lys Lys Asn
1 5

- 2 -

<210> 2

<211> 219

<212> PRT

<213> Helicoverpa

<400> 2

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

Leu Ile Ser Ala Ser Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

Gly Gln Asn Gln Ala Trp Arg Phe Thr Val Val Leu Val Met His Gly
50 55 60

Ser Trp Thr Pro Ser Leu Ile Arg Asn Asp Val Ala Val Ile Arg Leu
65 70 75 80

Gly Thr Asn Val Ala Thr Ser Asn Thr Ile Ala Ile Ile Ala Leu Pro
85 90 95

Ser Gly Ser Gln Ile Asn Glu Asn Phe Ala Gly Glu Thr Ala Leu Ala
100 105 110

Ser Gly Phe Gly Leu Thr Ser Asp Thr Gly Ser Ile Ser Ser Asn Gln
115 120 125

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Ala Leu Ser His Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Arg
130 135 140

Asn Ser Phe Pro Leu Leu Ile Gln Asp Ser Asn Ile Cys Thr Ser Gly
145 150 155 160

Ala Asn Gly Arg Ser Thr Cys Arg Gly Asp Ser Gly Gly Pro Leu Val
165 170 175

Val Thr Arg Asn Asn Arg Pro Leu Leu Ile Gly Ile Thr Ser Phe Gly
180 185 190

Ser Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val
195 200 205

Thr Ser Tyr Ile Ser Trp Ile Asn Gly Gln Leu
210 215

<210> 3

<211> 40

<212> PRT

<213> Helicoverpa

<400> 3

Val His Leu Glu Asp Ser Ile Asp Leu Glu Asp Ile Thr Ala Trp Gly
1 5 10 15

Tyr Leu Thr Lys Phe Gly Ile Pro Glu Ala Glu Lys Ile Arg Asn Ala
20 25 30

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Glu Glu Ala Ser Ser Ala Ser Arg
 35 40

<210> 4

<211> 708

<212> DNA

<213> Helicoverpa

<400> 4

atcgtcgggtg gttcattgtc cagtgtcggg cagatccctt accaggctgg tctcgtcatt	60
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accgctgctc actgctgggt cgacggccaa aaccaggcct ggagattcac cgttgttctt	180
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aggagcactt gccgcggtga ctccggcggg cctctcgtcg tcaccaggaa caacagacca	600
ctcttgatcg gtatcacctc ttccggatct gccgcggtt gccaaagtgg atctcccgt	660
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<210> 5

<211> 120

<212> DNA

<213> Helicoverpa

<400> 5

gttcacctcg aggattctat tgatctggaa gatattaccg cttggggata cctcaccaaa 60

ttcgggtattc cagaagctga gaaaatccgc aacgctgaag aagctagctc tgctagcagg 120

<210> 6

<211> 921

<212> DNA

<213> Helicoverpa

<400> 6

gttcacctcg aggattctat tgatctggaa gatattaccg cttggggata cctcaccaaa 60

ttcgggtattc cagaagctga gaaaatccgc aacgctgaag aagctagctc tgctagcagg 120

atcgtcggtg gttcattgtc cagtgtcgga cagatccctt accaggctgg tctcgtcatt 180

gacttagcag gtggccaggc tgtctgcgga ggctccctga tcagcgcttc ccgcgtactg 240

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ggttccacca ccttggttctc tggcgggtacc agaatcccta catccaatgt tgttatgcac 360

ggaagctgga ctctagcct tatccgtaac gatgttgccg taatcagatt gggcaccaac 420

gtagcaacct caaacaccat tgccatcatc gctctacca gcggcagcca gatcaacgag 480

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atctccagca accaggctct gagccacgtc aacctgccag tgatcaccaa cgctgtgtgc 600

agaaattcat tccccctgct gatccaggac tctaacattt gcaccagcgg tgccaacggc 660

- 6 -

aggagcactt gccgcggtga ctccggcggt cctctcgtcg tcaccaggaa caacagacca 720
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gccttcgcca gagtcacctc ttacatcagc tggatcaacg gccagctcta aaatatcgaa 840
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<211> 32

<212> DNA

<213> artificial sequence

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<223> BamHI oligonucleotide primer

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gaccagccgg atccgatcgg atatgcacca ac 32

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<211> 34

<212> DNA

<213> artificial sequence

<220>

<223> HindIII oligonucleotide primer

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- 7 -

<210> 9

<211> 36

<212> PRT

<213> artificial sequence

<220>

<223> N-terminal sequence of resistant chymotrypsin

<400> 9

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

Leu Ile Ser Ala
35

<210> 10

<211> 29

<212> DNA

<213> artificial sequence

<220>

<223> Fw2ResChy primer

<400> 10

tcagctgtag ctggagctca agatactcc

- 8 -

<210> 11

<211> 35

<212> DNA

<213> artificial sequence

<220>

<223> FwResChym primer

<400> 11

gtagctatac tgactctagc tgcagctgga gctgg

35

<210> 12

<211> 21

<212> DNA

<213> artificial sequence

<220>

<223> Hc35PQE-6-Fw primer

<400> 12

ttaaccatgg tgatcgacct c

21

<210> 13

<211> 23

<212> DNA

<213> artificial sequence

<220>

<223> Hc35PQ-60-Rv primer

<400> 13

gatgagatct gagacgttgg ttg

23

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<210> 14

<211> 25

<212> DNA

<213> artificial sequence

<220>

<223> gene specific sense primer

<400> 14

cgggatccat ggagtcaaag ttgtc

25

<210> 15

<211> 25

<212> DNA

<213> artificial sequence

<220>

<223> gene specific antisense primer

<400> 15

gcgtcgacgc ttaagccacc ctagg

25

<210> 16

<211> 24

<212> DNA

<213> artificial sequence

<220>

<223> StPOTIA sense primer

<400> 16

cgggatccaa ggaatcggaa tctg

24

- 10 -

<210> 17

<211> 23

<212> DNA

<213> artificial sequence

<220>

<223> StPOTIB sense primer

<400> 17

cgggatccaa ggaatttgaa tgc

23

<210> 18

<211> 22

<212> DNA

<213> artificial sequence

<220>

<223> StPOTIA/B antisense primer

<400> 18

cgagctotta agccacccta gg

22

<210> 19

<211> 40

<212> DNA

<213> artificial sequence

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<223> FWBacRECHI (5'-3'), primer

<400> 19

ttggettttcg ccgcggtcgt ctccgcgagg aacgggtccc

40

- 11 -

<210> 20

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<212> DNA

<213> artificial sequence

<220>

<223> FWBacRECH2 (5'-3') primer

<400> 20

ggatccatga aactcttggc tgtgactcta ttggctttcg

40

<210> 21

<211> 25

<212> DNA

<213> artificial sequence

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<223> RvRECH (3'-5') primer

<400> 21

gatcaacggc cagctctaaa agctt

25

<210> 22

<211> 53

<212> PRT

<213> peptide

<400> 22

Met Ala Val His Arg Val Ser Phe Leu Ala Leu Leu Leu Phe Gly
 1 5 10 15

Met Ser Leu Leu Val Ser Asn Val Glu His Ala Asp Ala Lys Ala Cys
 20 25 30

- 12 -

Thr Leu Asn Cys Asp Pro Arg Ile Ala Tyr Gly Val Cys Pro Arg Ser
35 40 45

Glu Glu Lys Lys Asn
50

<210> 23
<211> 58
<212> PRT
<213> peptide

<400> 23

Asp Arg Ile Cys Thr Asn Cys Cys Ala Gly Thr Lys Gly Cys Lys Tyr
1 5 10 15

Phe Ser Asp Asp Gly Thr Phe Val Cys Glu Gly Glu Ser Asp Pro Arg
20 25 30

Asn Pro Lys Ala Cys Thr Leu Asn Cys Asp Pro Arg Ile Ala Tyr Gly
35 40 45

Val Cys Pro Arg Ser Glu Glu Lys Lys Asn
50 55

- 13 -

<210> 24

<211> 58

<212> PRT

<213> peptide

<400> 24

Asp Arg Ile Cys Thr Asn Cys Cys Ala Gly Thr Lys Gly Cys Lys Tyr
1 5 10 15

Phe Ser Asp Asp Gly Thr Phe Val Cys Glu Gly Glu Ser Asp Pro Arg
20 25 30

Asn Pro Lys Ala Cys Pro Arg Asn Cys Asp Pro Arg Ile Ala Tyr Gly
35 40 45

Ile Cys Pro Leu Ala Glu Glu Lys Lys Asn
50 55

<210> 25

<211> 58

<212> PRT

<213> peptide

<400> 25

Asp Arg Ile Cys Thr Asn Cys Cys Ala Gly Lys Lys Gly Cys Lys Tyr
1 5 10 15

Phe Ser Asp Asp Gly Thr Phe Val Cys Glu Gly Glu Ser Asp Pro Lys
20 25 30

- 14 -

Asn Pro Lys Ala Cys Pro Arg Asn Cys Asp Gly Arg Ile Ala Tyr Gly
35 40 45

Ile Cys Pro Leu Ser Glu Glu Lys Lys Asn
50 55

<210> 26

<211> 58

<212> PRT

<213> peptide

<400> 26

Asp Arg Ile Cys Thr Asn Cys Cys Ala Gly Lys Lys Gly Cys Lys Tyr
1 5 10 15

Phe Ser Asp Asp Gly Thr Phe Val Cys Glu Gly Glu Ser Asp Pro Arg
20 25 30

Asn Pro Lys Ala Cys Pro Arg Asn Cys Asp Gly Arg Ile Ala Tyr Gly
35 40 45

Ile Cys Pro Leu Ser Glu Glu Lys Lys Asn
50 55

- 15 -

<210> 27
<211> 54
<212> PRT
<213> peptide

<400> 27

Asp Arg Ile Cys Thr Asn Cys Cys Ala Gly Lys Lys Gly Cys Lys Tyr
1 5 10 15

Phe Ser Asp Asp Gly Thr Phe Ile Cys Glu Gly Glu Ser Glu Tyr Ala
20 25 30

Ser Lys Val Asp Glu Tyr Val Gly Glu Val Glu Asn Asp Leu Gln Lys
35 40 45

Ser Lys Val Ala Val Ser
50

<210> 28
<211> 36
<212> PRT
<213> Helicoverpa

<400> 28

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

- 16 -

Leu Ile Ser Ala

35

<210> 29

<211> 29

<212> PRT

<213> Helicoverpa

<400> 29

Ile Val Gly Gly Ser Ile Ser Ser Ile Gly Gln Ile Pro Tyr Gly Ala

1

5

10

15

Gly Leu Val Ile Asp Phe Ala Gly Gly Gln Ala Val Cys

20

25

<210> 30

<211> 29

<212> PRT

<213> Helicoverpa

<400> 30

Ile Val Gly Gly Ser Thr Ser Ser Val Gly Gln Phe Pro Tyr Gln Ala

1

5

10

15

Gly Leu Leu Ala Ser Phe Ala Gly Gly Gln Ala Val Cys

20

25

- 17 -

<210> 31
<211> 29
<212> PRT
<213> Helicoverpa

<400> 31

Ile Val Gly Gly Ser Val Thr Thr Leu Asp Ala Tyr Pro Thr Ile Ala
1 5 10 15

Gly Leu Val Tyr Asn Phe Ala Gly Gly Gln Ala Val Cys
20 25

<210> 32
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<212> PRT
<213> H. punctigera

<400> 32

Met Lys Leu Leu Ala Val Thr Leu Leu Ala Phe Ala Ala Val Val Ser
1 5 10 15

Ala Arg Asn Ile Asp Leu Glu Asp Val Ile Asp Leu Glu Asp Ile Thr
20 25 30

Ala Tyr Asp Tyr His Thr Lys Ile Gly Ile Pro Leu Ala Glu Lys Ile
35 40 45

Arg Ala Ala Glu Glu Glu Ala Glu Arg Asn Pro Ser Arg Ile Val Gly
50 55 60

- 18 -

Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala Gly Leu Leu
65 70 75 80

Ala Thr Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser Leu Leu Asn
85 90 95

Asn Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn
100 105 110

Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg Leu Phe Ser
115 120 125

Gly Gly Thr Arg Leu Asn Thr Ala Ser Val Val Met His Gly Ser Trp
130 135 140

Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Met Ile Asn Leu Pro Ser
145 150 155 160

Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly
165 170 175

Asn Glu Leu Asn Asn Asn Phe Asn Gly Ala Thr Ala Val Ala Ser Gly
180 185 190

Phe Gly Leu Ala Arg Asp Gly Gly Ser Val Asp Gly Asn Leu Arg His
195 200 205

Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Thr Val Ser Phe Pro
210 215 220

- 19 -

Gly Ile Ile Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg
 225 230 235 240

Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val Thr Ser Asn
 245 250 255

Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Ala Arg Gly
 260 265 270

Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Ile
 275 280 285

Ser Trp Ile Asn Gln Arg Leu
 290 295

<210> 33

<211> 292

<212> PRT

<213> H. punctigera

<400> 33

Leu Ala Val Thr Leu Leu Ala Phe Ala Ala Val Val Ser Ala Arg Asn
 1 5 10 15

Ile Asp Leu Glu Asp Val Ile Asp Leu Glu Asp Ile Thr Ala Tyr Asp
 20 25 30

Tyr His Thr Lys Ile Gly Ile Pro Leu Ala Glu Lys Ile Arg Ala Ala

- 20 -

35

40

45

Glu Glu Glu Ala Glu Arg Asn Pro Ser Arg Ile Val Gly Gly Ser Thr
50 55 60

Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala Gly Leu Leu Ala Thr Phe
65 70 75 80

Ala Ser Gly Gln Gly Val Cys Gly Gly Ser Leu Leu Asn Asn Arg Arg
85 90 95

Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn Gln Ala Arg
100 105 110

Ser Phe Thr Val Val Leu Gly Ser Val Arg Leu Phe Ser Gly Gly Thr
115 120 125

Arg Leu Asn Thr Ala Ser Val Val Met His Gly Ser Trp Asn Pro Asn
130 135 140

Leu Ile Arg Asn Asp Ile Ala Met Ile Asn Leu Pro Ser Asn Val Ala
145 150 155 160

Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly Asn Glu Leu
165 170 175

Asn Asn Asn Phe Asn Gly Ala Thr Ala Val Ala Ser Gly Phe Gly Leu
180 185 190

- 21 -

Ala Arg Asp Gly Gly Ser Val Asp Gly Asn Leu Arg His Val Asn Leu
195 200 205

Pro Val Ile Thr Asn Ala Val Cys Thr Val Ser Phe Pro Gly Ile Ile
210 215 220

Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg Gly Thr Cys
225 230 235 240

Gln Gly Asp Ser Gly Gly Pro Leu Val Val Thr Ser Asn Asn Arg Arg
245 250 255

Ile Leu Ile Gly Val Thr Pro Phe Gly Ser Ala Arg Gly Cys Gln Val
260 265 270

Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Ile Ser Trp Ile
275 280 285

Asn Gln Arg Leu
290

- 22 -

<210> 34

<211> 295

<212> PRT

<213> H. punctigera

<400> 34

Met Lys Leu Leu Ala Val Thr Leu Leu Ala Phe Ala Ala Ile Val Ser
1 5 10 15

Ala Arg Asn Ile Asp Leu Glu Asp Val Ile Asp Leu Glu Asp Ile Thr
20 25 30

Ala Tyr Asp Tyr His Thr Lys Ile Gly Ile Pro Leu Ala Glu Lys Ile
35 40 45

Arg Ala Ala Glu Glu Glu Ala Glu Arg Asn Pro Ser Arg Ile Val Gly
50 55 60

Gly Ser Ile Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala Gly Leu Leu
65 70 75 80

Ala Thr Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser Leu Leu Asn
85 90 95

Asn Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn
100 105 110

Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg Leu Phe Ser
115 120 125

- 23 -

Gly Gly Thr Arg Leu Asn Thr Ala Ser Val Val Met His Gly Ser Trp
130 135 140

Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Ile Ile Asn Leu Pro Ser
145 150 155 160

Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly
165 170 175

Asn Glu Leu Asn Asn Asn Phe Asn Gly Ala Thr Ala Val Ala Ser Gly
180 185 190

Phe Gly Leu Ala Asn Asp Gly Gly Ser Val Asp Gly Asn Leu Arg His
195 200 205

Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Thr Val Ser Phe Pro
210 215 220

Gly Ile Ile Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg
225 230 235 240

Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val Thr Ser Asn
245 250 255

Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Ala Arg Gly
260 265 270

- 24 -

Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Ile
 275 280 285

Ser Trp Ile Asn Asn Leu Leu
 290 295

<210> 35
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 <213> H. punctigera

<400> 35

Ile Asn His Glu Ala Val Val Asp Leu Glu Asp Ile Thr Ala Tyr Gly
 1 5 10 15

Tyr His Thr Lys Val Gly Ile Pro Leu Ala Glu Glu Ile Arg Ile Ala
 20 25 30

Glu Leu Glu Ala Ser Arg Asn Pro Ser Arg Ile Val Gly Gly Ser Ser
 35 40 45

Ala Ser Leu Gly Gln Phe Pro Tyr Gln Ala Gly Leu Leu Ile Asn Leu
 50 55 60

Pro Leu Gly Gln Ser Val Cys Gly Gly Ser Leu Leu Asn Gln Arg Arg
 65 70 75 80

Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn Gln Ala Asn
 85 90 95

- 25 -

Ser Leu Thr Val Ile Leu Gly Ser Ile Asn Leu Tyr Phe Gly Gly Thr
100 105 110

Arg Leu Asn Ser Asn Ser Val Val Met His Gly Ser Trp Asn Pro Asn
115 120 125

Leu Ile Arg Asn Asp Ile Ala Ile Ile Asn Leu Pro Ser Asn Val Gly
130 135 140

Thr Ser Asn Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly Asn Glu Leu
145 150 155 160

Asn Asn Gln Phe Ala Gly Phe Thr Ala Thr Ala Ser Gly Phe Gly Arg
165 170 175

Thr Arg Asp Gly Gly Ser Val Ser Pro Thr Leu Asn His Val Asn Leu
180 185 190

Pro Val Ile Thr Asn Asn Val Cys Trp Gln Ser Phe Pro Leu Tyr Ile
195 200 205

Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg Ser Thr Cys
210 215 220

Gln Gly Asp Ser Gly Gly Pro Leu Val Val Thr Ser Asn Asn Arg Arg
225 230 235 240

- 26 -

Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Asp Arg Gly Cys Gln Val
245 250 255

Gly Ala Pro Ala Ala Phe Ala Arg Val Thr Ser Tyr Ile Ser Trp Ile
260 265 270

Asn Gln Arg Leu
275

<210> 36

<211> 292

<212> PRT

<213> H. punctigera

<400> 36

Met Lys Leu Phe Leu Gly Val Cys Leu Thr Leu Ala Val Ala Val Ser
1 5 10 15

Ala Val Glu Ile Ala Thr Pro Asp Ala Asp Ser Pro Val Phe Gly Tyr
20 25 30

His Ala Lys Phe Gly Ile Ala Glu Ala Ala Arg Ile Lys Ser Ala Glu
35 40 45

Glu Val Gln Ser Phe Asn Gly Gln Arg Ile Val Gly Gly Ser Ile Thr
50 55 60

Asn Ile Ala Asn Val Pro Tyr Gln Ala Gly Leu Val Ile Thr Ile Phe
65 70 75 80

- 27 -

Ile Phe Gln Ser Val Cys Gly Ala Ser Leu Ile Ser His Asn Arg Leu
85 90 95

Val Thr Ala Ala His Cys Lys Ser Asp Gly Val Leu Thr Ala Asn Ser
100 105 110

Phe Thr Val Val Leu Gly Ser Asn Thr Leu Phe Phe Gly Gly Thr Arg
115 120 125

Ile Asn Thr Asn Asp Val Val Met His Pro Asn Trp Asn Pro Asn Thr
130 135 140

Ala Ala Asn Asp Ile Ala Val Leu Arg Ile Ser Ser Val Ser Phe Ser
145 150 155 160

Asn Val Ile Gln Pro Ile Ala Leu Pro Ser Gly Asp Glu Leu Asn Asn
165 170 175

Leu Phe Val Gly Ala Asn Ala Leu Ala Ser Gly Phe Gly Arg Thr Ser
180 185 190

Asp Ser Gly Ser Ile Gly Thr Asn Gln Gln Leu Ser Ser Val Thr Ile
195 200 205

Pro Val Ile Thr Asn Ala Gln Cys Ala Ala Val Tyr Gly Ser Gly Phe
210 215 220

- 28 -

Val His Ala Ser Asn Ile Cys Thr Ser Gly Ala Gly Gly Lys Gly Thr
225 230 235 240

Cys Asn Gly Asp Ser Gly Gly Pro Leu Ala Val Asp Ser Asn Asn Arg
245 250 255

Lys Ile Leu Ile Gly Val Thr Ser Tyr Gly Ala Gln Ala Gly Cys Ala
260 265 270

Ala Gly Phe Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Val Asp Trp
275 280 285

Val Gln Ser Gln
290

<210> 37
<211> 257
<212> PRT
<213> H. punctigera

<400> 37

His Asn Lys Trp Val Leu Thr Ala Ala His Cys Leu Ala Asn Arg Ile
1 5 10 15

Thr Phe Val Val Arg Phe Gly Leu Thr Asn Leu Thr Arg Pro Glu Ile
20 25 30

Leu Val Glu Ser Ala Asn Lys Tyr Ile His Pro Asp Tyr Asp Glu Ile
35 40 45

- 29 -

Arg Ala Gly Val Gln Thr Ala Asp Leu Ala Leu Val Gly Leu Asp His
50 55 60

His Ile Glu Tyr Ser Ala Asn Val Gln Pro Ser Arg Leu Met Ser Ser
65 70 75 80

Ala Gln Lys Asn Ile Asn Tyr Glu Gly Ile Gln Met Ile Val Ser Gly
85 90 95

Phe Gly Arg Thr Asp Asp Leu Trp Asn Gly Gly Ala Ala Ser Glu Ile
100 105 110

Leu Leu Trp Val Tyr Gln Arg Gly Val Ser Asn Glu Glu Cys Leu Arg
115 120 125

Trp Tyr Pro Thr Ser Gln Val Ile Lys Glu Glu Thr Ile Cys Ala Gly
130 135 140

Tyr Trp Asp Asn Pro Ser Gln Ser Ser Cys Gln Gly Asp Ser Gly Gly
145 150 155 160

Pro Leu Thr Ile Ile Asp Ala Asp Gly Glu Arg Thr Gln Val Gly Ile
165 170 175

Val Ser Phe Gly Ser Thr Ala Gly Cys Asn Ser Pro Phe Pro Ser Gly
180 185 190

- 30 -

Tyr Val Arg Pro Gly His Tyr His Asp Trp Phe Thr Glu Val Thr Gly
195 200 205

Ile Asn Phe Asp Trp Asp Ser Asp Ala Ile Ile Pro Gly Ser Ser Glu
210 215 220

Ser Glu Glu Asp Gly Ser Asn Pro Ser Ser Glu Glu Asp Ala Gly Ser
225 230 235 240

Pro Pro Ser Glu Glu Glu Glu Ala Pro Glu Lys Val Arg Val Val Glu
245 250 255

Tyr

<210> 38

<211> 19

<212> DNA

<213> artificial sequence

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<223> FWG1 primer

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tcccttacca ggcgctgtc

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<210> 39
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<223> RVG4 primer

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tctggcgaag gcagcagg

18

<210> 40
<211> 20
<212> DNA
<213> artificial sequence

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<223> Y79Fw primer

<400> 40
ctgctagcct cggacaattc

20

<210> 41
<211> 20
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<223> Y72Fw primer

<400> 41
ctggagtgca gactgctgac

20

- 32 -

<210> 42
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<212> DNA
<213> artificial sequence

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<223> Y72Rv primer

<400> 42
ggatgatggc gtcgctgtcc

20

<210> 43
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<212> PRT
<213> H. punctigera

<400> 43

Pro Tyr Gln Ala Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val
1 5 10 15

Cys Gly Ala Ser Leu Ile Pro His Asn Arg Leu Val Thr Ala Ala His
20 25 30

Cys Lys Ser Asp Gly Val Leu Thr Ala Asn Ser Phe Thr Val Val Leu
35 40 45

Gly Ser Asn Thr Leu Phe Phe Gly Gly Thr Arg Ile Asn Thr Asn Asp
50 55 60

Val Val Met His Pro Asn Trp Asn Pro Ser Thr Ala Ala Asn Asp Ile
65 70 75 80

- 33 -

Ala Val Met Arg Ile Ser Ser Val Ser Phe Ser Asn Val Ile Gln Pro
85 90 95

Ile Ala Leu Pro Ser Gly Asp Glu Leu Asn Asn Leu Phe Val Gly Ala
100 105 110

Asn Ala Leu Ala Ser Gly Phe Gly Arg Thr Ser Asp Gly Gly Ser Ile
115 120 125

Gly Ser Asn Gln Gln Val Ser Ser Val Thr Ile Pro Val Ile Thr Asn
130 135 140

Asp Glu Cys Ala Ala Val Tyr Gly Ser Ala Phe Val His Ser Ser Asn
145 150 155 160

Ile Cys Thr Ser Gly Ala Gly Gly Lys Gly Thr Cys Asn Gly Asp Ser
165 170 175

Gly Gly Pro Leu Ala Ile Asp Ser Asn Asn Glu Lys Ile Leu Ile Gly
180 185 190

Val Thr Ser Tyr Gly Ala Gln Ala Gly Cys Ala Ala Gly Leu Pro Ala
195 200 205

Ala Phe Ala Arg Lys
210

- 34 -

<210> 44

<211> 213

<212> PRT

<213> H. punctigera

<400> 44

Pro Tyr Gln Ala Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val
1 5 10 15

Cys Gly Ala Ser Leu Ile Ser His Asn Arg Leu Val Thr Ala Ala His
20 25 30

Cys Lys Phe Asp Gly Val Met Thr Ala Asn Ser Phe Thr Val Val Leu
35 40 45

Gly Ser Asn Thr Leu Phe Phe Gly Gly Thr Arg Ile Asn Thr Asn Asp
50 55 60

Val Val Met His Pro Asn Trp Asn Pro Ser Thr Val Ala Asn Asp Ile
65 70 75 80

Ala Val Ile Arg Ile Ser Ser Ile Val Phe Asn Asn Val Ile Gln Pro
85 90 95

Ile Ala Leu Pro Ser Gly Asp Glu Leu Asn Asn Leu Phe Val Gly Ala
100 105 110

Asn Ala Leu Ala Ser Gly Phe Gly Arg Thr Ser Asp Ser Gly Gly Ile
115 120 125

- 35 -

Gly Thr Asn Gln Gln Leu Ser Ser Val Thr Ile Pro Val Ile Thr Asn
 130 135 140

Ala Glu Cys Ala Ala Val Tyr Gly Pro Ala Phe Val His Asp Thr Asn
 145 150 155 160

Ile Cys Thr Ser Gly Ala Gly Gly Lys Gly Thr Cys Asn Gly Asp Ser
 165 170 175

Gly Gly Pro Leu Ala Val Asp Ser Asn Asp Lys Lys Ile Leu Ile Gly
 180 185 190

Val Thr Ser Tyr Gly Ala Ala Asp Gly Cys Ala Ala Gly Phe Pro Ala
 195 200 205

Ala Ser Pro Glu Arg
 210

<210> 45

<211> 177

<212> PRT

<213> H. punctigera

<400> 45

Pro Tyr Gln Ala Gly Leu Leu Ala Asn Phe Ala Ser Gly Gln Gly Val
 1 5 10 15

Cys Gly Gly Ser Leu Leu Asn Gln Arg Arg Val Leu Thr Ala Ala His
 20 25 30

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Cys Trp Phe Asp Gly Arg Asn Gln Ala Arg Ser Phe Thr Val Val Leu
35 40 45

Gly Ser Val Arg Leu Phe Ser Gly Gly Thr Arg Leu Asp Thr Ala Ser
50 55 60

Val Val Met His Gly Ser Trp Asn Pro Asn Leu Ile Arg Asn Asp Ile
65 70 75 80

Ala Met Ile Asn Leu Pro Ser Asn Val Ala Thr Ser Gly Asn Ile Ala
85 90 95

Pro Ile Ala Leu Pro Ser Gly Asn Glu Leu Asn Asn Asn Phe Asn Gly
100 105 110

Ala Thr Ala Thr Ala Ser Gly Phe Gly Leu Ala Arg Asp Gly Gly Ser
115 120 125

Val Asp Gly Asn Leu Arg His Val Asn Leu Pro Val Ile Thr Asn Ala
130 135 140

Val Cys Thr Val Ser Phe Pro Gly Ile Ile Gln Ser Ser Asn Ile Cys
145 150 155 160

- 37 -

Thr Ser Gly Ala Asn Gly Arg Ser Thr Cys Gln Gly Asp Ser Gly Gly
165 170 175

Pro

<210> 46

<211> 217

<212> PRT

<213> H. punctigera

<400> 46

Ser Ala Ser Leu Gly Gln Phe Pro Tyr Gln Ala Gly Leu Leu Ile Asn
1 5 10 15

Leu Pro Leu Gly Gln Ser Val Cys Gly Gly Ser Leu Leu Asn Gln Arg
20 25 30

Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn Gln Ala
35 40 45

Thr Ser Leu Thr Val Ile Leu Gly Ser Ile Asn Leu Phe Phe Gly Gly
50 55 60

Thr Arg Leu Asn Ser Asn Ser Val Val Met His Gly Ser Trp Asn Pro
65 70 75 80

Asn Leu Ile Arg Asn Asp Ile Ala Ile Ile Asn Leu Pro Ser Asn Val
85 90 95

- 38 -

Gly Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly Asn Glu
100 105 110

Leu Asn Asn Gln Phe Ala Gly Phe Thr Ala Thr Ala Ser Gly Phe Gly
115 120 125

Leu Thr Arg Asp Gly Gly Asn Val Ser Pro Thr Leu Asn His Val Asn
130 135 140

Leu Pro Val Ile Thr Asn Asn Val Cys Trp Gln Ser Phe Pro Leu Tyr
145 150 155 160

Ile Gln Ser Thr Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg Gly Thr
165 170 175

Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val Thr Ser Asn Asn Arg
180 185 190

Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Asp Arg Gly Cys Gln
195 200 205

Val Gly Ala Pro Ala Ala Phe Ala Arg
210 215

- 39 -

<210> 47

<211> 170

<212> PRT

<213> H. punctigera

<400> 47

Ser Gly Val Gln Thr Ala Asp Leu Ala Leu Val Gly Leu Asp Gln Glu
1 5 10 15

Ile Glu Tyr Ser Ala Asn Val Gln Pro Ser Arg Leu Met Ser Ser Ala
20 25 30

Gln Lys Asn Ile Asn Tyr Glu Gly Ile Gln Met Ile Val Ser Gly Phe
35 40 45

Gly Arg Thr Asp Asp Leu Trp Asn Gly Gly Ala Ala Ser Glu Ile Leu
50 55 60

Leu Trp Val Tyr Gln Arg Gly Val Ser Asn Glu Glu Cys Leu Arg Trp
65 70 75 80

Tyr Pro Thr Ser Gln Val Ile Lys Glu Gln Thr Ile Cys Ala Gly Tyr
85 90 95

Trp Asp Asn Pro Ser Gln Ser Ser Cys Gln Gly Asp Ser Gly Gly Pro
100 105 110

Leu Thr Ile Ile Asp Ala Asp Gly Glu Arg Thr Gln Val Gly Ile Val
115 120 125

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Ser Phe Gly Ser Thr Ala Gly Cys Asn Ser Pro Phe Pro Ser Gly Tyr
130 135 140

Val Arg Pro Gly His Tyr His Asp Trp Phe Thr Glu Val Thr Gly Ile
145 150 155 160

Asn Phe Asp Trp Asp Ser Asp Ala Ile Ile
165 170

<210> 48

<211> 279

<212> PRT

<213> H. punctigera

<400> 48

Ala Val Ser Ala Val Glu Ile Gly Thr Pro Asp Ala Asp Ser Pro Val
1 5 10 15

Phe Gly Tyr His Ala Lys Phe Gly Ile Pro Glu Ala Ala Arg Ile Lys
20 25 30

Ser Ala Glu Glu Val Gln Ser Phe Asn Gly Gln Arg Ile Val Gly Gly
35 40 45

Ser Ile Thr Asp Ile Ala Asn Val Pro Tyr Gln Ala Gly Leu Val Ile
50 55 60

Thr Ile Phe Ile Phe Gln Ser Val Cys Gly Ala Ser Leu Ile Ser His
65 70 75 80

- 41 -

Asn Arg Leu Val Thr Ala Ala His Cys Lys Ser Asp Gly Val Leu Thr
85 90 95

Ala Asn Ser Phe Thr Val Val Leu Gly Ser Asn Thr Leu Phe Phe Gly
100 105 110

Gly Thr Arg Ile Asn Thr Asn Asp Val Val Met His Pro Asn Trp Asn
115 120 125

Pro Ser Thr Ala Ala Asn Asp Ile Ala Val Met Arg Ile Ser Ser Val
130 135 140

Ser Phe Ser Asn Val Ile Gln Pro Ile Ala Leu Pro Ser Gly Asp Glu
145 150 155 160

Leu Asn Asn Leu Phe Val Gly Ala Asn Ala Leu Ala Ser Gly Phe Gly
165 170 175

Arg Thr Ser Asp Gly Gly Ser Ile Gly Ser Asn Gln Gln Val Ser Ser
180 185 190

Val Thr Ile Pro Val Ile Thr Asn Asp Glu Cys Ala Ala Val Tyr Gly
195 200 205

Ser Ala Phe Val His Ser Ser Asn Ile Cys Thr Ser Gly Ala Gly Gly
210 215 220

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Lys Gly Thr Cys Asn Gly Asp Ser Gly Gly Pro Leu Ala Val Asp Ser
225 230 235 240

Asn Asn Glu Lys Ile Leu Ile Gly Val Thr Ser Tyr Gly Ala Gln Ala
245 250 255

Gly Cys Ala Val Gly Leu Pro Ala Ala Phe Ala Arg Val Thr Ser Phe
260 265 270

Val Ser Trp Val Gln Ser Gln
275

<210> 49

<211> 292

<212> PRT

<213> H. punctigera

<400> 49

Met Lys Leu Phe Leu Gly Val Cys Leu Ala Leu Ala Val Ala Val Ser
1 5 10 15

Ala Val Glu Ile Gly Thr Pro Glu Ala Gly Ser Pro Val Phe Gly Tyr
20 25 30

His Ala Lys Phe Gly Ile Ala Glu Ala Ala Arg Ile Lys Ser Ala Glu
35 40 45

Glu Val Gln Ser Phe Asn Gly Gln Arg Ile Val Gly Gly Ser Ile Thr
50 55 60

- 43 -

Asn Ile Ala Asn Val Pro Tyr Gln Ala Gly Leu Val Ile Thr Ile Phe
65 70 75 80

Ile Phe Gln Ser Val Cys Gly Ala Ser Leu Ile Ser His Asn Arg Leu
85 90 95

Val Thr Ala Ala His Cys Lys Phe Asp Gly Val Met Thr Ala Asn Ser
100 105 110

Phe Thr Val Val Leu Gly Ser Asn Thr Leu Phe Phe Gly Gly Thr Arg
115 120 125

Ile Asn Thr Asn Asp Val Val Met His Pro Asn Trp Asn Pro Ser Thr
130 135 140

Val Ala Asn Asp Ile Ala Val Ile Arg Ile Ser Ser Ile Val Tyr Asn
145 150 155 160

Asn Val Ile Gln Pro Ile Ala Leu Pro Ser Gly Asp Glu Leu Asp Asn
165 170 175

Leu Phe Val Gly Ala Asn Ala Leu Ala Ser Gly Phe Gly Arg Thr Ser
180 185 190

Asp Ser Gly Gly Ile Gly Thr Asn Gln Gln Leu Ser Ser Val Thr Ile
195 200 205

- 44 -

Pro Val Ile Thr Asn Ala Glu Cys Ala Ala Val Tyr Gly Pro Ala Phe
 210 215 220

Val His Asp Thr Asn Ile Cys Thr Ser Gly Ala Gly Gly Lys Gly Thr
 225 230 235 240

Cys Asn Gly Asp Ser Gly Gly Pro Leu Ala Val Asp Ser Asn Asp Lys
 245 250 255

Lys Ile Leu Ile Gly Val Thr Ser Tyr Gly Ala Ala Asp Gly Cys Ala
 260 265 270

Ala Gly Phe Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Val Ser Trp
 275 280 285

Val Gln Ser Gln
 290

<210> 50
 <211> 295
 <212> PRT
 <213> H. punctigera

<400> 50

Met Lys Leu Leu Ala Val Thr Leu Leu Ala Phe Ala Ala Val Val Ser
 1 5 10 15

Ala Arg Asn Ile Asp Leu Glu Asp Val Ile Asp Leu Glu Asp Ile Thr
 20 25 30

- 45 -

Ala Tyr Asp Tyr His Thr Lys Ile Gly Ile Pro Leu Ala Glu Glu Ile
35 40 45

Arg Ala Ala Glu Glu Glu Ala Glu Arg Asp Pro Ser Arg Ile Val Gly
50 55 60

Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala Gly Leu Leu
65 70 75 80

Ala Asn Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser Leu Leu Asn
85 90 95

Gln Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn
100 105 110

Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg Leu Phe Ser
115 120 125

Gly Gly Thr Arg Leu Asp Thr Ala Ser Val Val Met His Gly Ser Trp
130 135 140

Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Met Ile Asn Leu Pro Ser
145 150 155 160

Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly
165 170 175

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Asn Glu Leu Asn Asn Asn Phe Asn Gly Ala Thr Ala Thr Ala Ser Gly
180 185 190

Phe Gly Leu Ala Arg Asp Gly Gly Ser Val Asp Gly Asn Leu Arg His
195 200 205

Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Thr Val Ser Phe Pro
210 215 220

Gly Ile Ile Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg
225 230 235 240

Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val Asn Ser Asn
245 250 255

Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Ala Arg Gly
260 265 270

Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Phe Ile
275 280 285

Ser Trp Ile Asn Gln Arg Leu
290 295

- 47 -

<210> 51
<211> 295
<212> PRT
<213> H. punctigera

<400> 51

Met Lys Leu Leu Ala Val Thr Leu Leu Ala Phe Ala Ala Val Val Ser
1 5 10 15

Ala Arg Asn Ile Asp Leu Glu Asp Val Ile Asp Leu Glu Asp Ile Thr
20 25 30

Ala Tyr Asp Tyr His Thr Lys Ile Gly Ile Pro Leu Ala Glu Lys Ile
35 40 45

Arg Ala Ala Glu Glu Glu Ala Glu Arg Asn Pro Ser Arg Ile Val Gly
50 55 60

Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala Gly Leu Leu
65 70 75 80

Ala Ser Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser Leu Leu Asn
85 90 95

Val Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly Arg Asn
100 105 110

Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg Leu Tyr Ser
115 120 125

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Gly Gly Thr Arg Leu Asn Thr Ala Ser Val Val Met His Gly Ser Trp
130 135 140

Asn Pro Asn Leu Val Arg Asn Asp Ile Ala Met Ile Asn Leu Pro Ser
145 150 155 160

Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu Pro Ser Gly
165 170 175

Asn Glu Leu Asn Asn Gln Phe Ala Gly Ala Thr Ala Thr Ala Ser Gly
180 185 190

Phe Gly Leu Ala Arg Asp Gly Gly Val Ile Asp Gly Asn Leu Arg His
195 200 205

Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Ser Gln Ser Phe Pro
210 215 220

Gly Leu Ile Gln Ala Ser Asn Val Cys Thr Ser Gly Ala Asn Gly Arg
225 230 235 240

Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val Asn Ser Asn
245 250 255

Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser Ala Arg Gly
260 265 270

- 49 -

Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Ser Ser Tyr Ile
275 280 285

Ser Trp Ile Asn Gln Arg Leu
290 295

<210> 52
<211> 234
<212> PRT
<213> H. punctigera

<400> 52

Ile Val Gly Gly Ser Ser Ala Ser Leu Gly Gln Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ile Asn Leu Pro Leu Gly Gln Ser Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Gln Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

Gly Arg Asn Gln Ala Thr Ser Leu Thr Val Ile Leu Gly Ser Ile Asn
50 55 60

Leu Phe Phe Gly Gly Thr Arg Leu Asn Ser Asn Ser Val Val Met Gln
65 70 75 80

Gly Ser Trp Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Ile Ile Asn
85 90 95

- 50 -

Leu Pro Ser Asn Val Gly Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu
100 105 110

Pro Ser Gly Asn Glu Leu Asn Asn Gln Phe Ala Gly Phe Thr Ala Thr
115 120 125

Ala Ser Gly Phe Gly Leu Thr Arg Asp Gly Gly Asn Val Ser Pro Thr
130 135 140

Leu Asn His Val Asn Leu Pro Val Ile Thr Asn Asn Val Cys Trp Gln
145 150 155 160

Ser Phe Pro Leu Tyr Ile Gln Ser Thr Asn Ile Cys Thr Ser Gly Ala
165 170 175

Asn Gly Arg Gly Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val
180 185 190

Thr Ser Asn Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser
195 200 205

Asp Arg Gly Cys Gln Val Gly Ala Pro Ala Ala Phe Ala Arg Val Thr
210 215 220

Ser Tyr Ile Ser Trp Ile Asn Gln Arg Leu
225 230

- 51 -

<210> 53
<211> 296
<212> PRT
<213> H. punctigera

<400> 53

Met Ala Ala Ala Tyr Leu Leu Gly Leu Leu Phe Val Leu Gly Tyr Val
1 5 10 15

Gln Gly Gly Leu Leu Asn Ala Asp Pro Ala Ile Ile Glu Asp Leu Arg
20 25 30

Asp Ala Glu Phe Ser Ser Gly Ser Arg Ile Val Ala Gly Trp Pro Ala
35 40 45

Val Glu Gly Gln Ile Pro Tyr Gln Gly Ser Leu Arg Met Val Ser Ala
50 55 60

Ile Gly Gly Val Ser Ser Cys Gly Cys Ser Leu Ile His Asn Lys Trp
65 70 75 80

Val Leu Thr Ala Ala His Cys Leu Ala Asn Arg Ile Thr Phe Val Val
85 90 95

Arg Phe Gly Leu Thr Asn Leu Thr Arg Pro Glu Ile Leu Val Glu Ser
100 105 110

Thr Asn Lys Tyr Ile His Pro Glu Tyr Asp Glu Ile Arg Ala Gly Val
115 120 125

- 52 -

Gln Thr Ala Asp Leu Ala Leu Val Gly Leu Asp His Glu Ile Glu Tyr
130 135 140

Ser Ala Asn Val Gln Pro Ser Arg Leu Met Ser Ser Ala Gln Lys Asn
145 150 155 160

Ile Asn Tyr Glu Gly Ile Gln Met Ile Val Ser Gly Phe Gly Arg Thr
165 170 175

Asp Asp Leu Trp Asn Gly Gly Ala Ala Ser Glu Ile Leu Leu Trp Val
180 185 190

Tyr Gln Arg Gly Val Ser Asn Glu Glu Cys Leu Arg Trp Tyr Pro Thr
195 200 205

Ser Gln Val Ile Lys Glu Gln Thr Ile Cys Ala Gly Tyr Trp Asp Asn
210 215 220

Pro Ser Gln Ser Ser Cys Gln Gly Asp Ser Gly Gly Pro Leu Thr Ile
225 230 235 240

Ile Asp Ala Asp Gly Glu Arg Thr Gln Ser Arg Tyr Cys Glu Leu Arg
245 250 255

Ile His Cys Trp Asn Ala Ala His Ser Pro Gln Gly Tyr Val Arg Pro
260 265 270

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Gly His Tyr His Asp Trp Phe Thr Glu Val Thr Gly Ile Asn Phe Asp
275 280 285

Trp Asp Ser Asp Ala Ile Ile Pro
290 295

<210> 54
<211> 365
<212> PRT
<213> H. punctigera

<400> 54

Met Ala Ala Ala Tyr Leu Leu Gly Leu Leu Phe Val Leu Gly Tyr Val
1 5 10 15

Gln Gly Gly Leu Leu Asn Ala Asp Pro Ala Ile Ile Glu Asp Leu Arg
20 25 30

Asp Ala Glu Phe Ser Ser Phe Ser Arg Ile Val Ala Gly Trp Pro Ala
35 40 45

Val Glu Gly Gln Ile Pro Tyr Gln Gly Ser Leu Arg Met Val Ser Ala
50 55 60

Ile Gly Gly Val Ser Ser Cys Gly Cys Ser Leu Ile His Asn Lys Trp
65 70 75 80

Val Leu Thr Ala Ala His Cys Leu Ala Asn Arg Ile Thr Phe Val Val
85 90 95

- 54 -

Arg Phe Gly Leu Thr Asn Leu Thr Arg Pro Glu Ile Leu Val Glu Ser
100 105 110

Thr Asn Lys Tyr Ile His Pro Glu Tyr Asp Glu Ile Arg Ala Gly Val
115 120 125

Gln Thr Ala Asp Leu Ala Leu Val Gly Leu Asp Gln Glu Ile Glu Tyr
130 135 140

Ser Ala Asn Val Gln Pro Ser Arg Leu Met Ser Ser Ala Gln Lys Asn
145 150 155 160

Ile Asn Tyr Glu Gly Ile Gln Met Ile Val Ser Gly Phe Gly Arg Thr
165 170 175

Asp Asp Leu Trp Asn Gly Gly Ala Ala Ser Glu Ile Leu Leu Trp Val
180 185 190

Tyr Gln Arg Gly Val Ser Asn Glu Glu Cys Leu Arg Trp Tyr Pro Thr
195 200 205

Ser Gln Val Ile Lys Glu Gln Thr Ile Cys Ala Gly Tyr Trp Asp Asn
210 215 220

Pro Ser Gln Ser Ser Cys Gln Gly Asp Ser Gly Gly Pro Leu Thr Ile
225 230 235 240

- 55 -

Ile Asp Ala Asp Gly Glu Arg Thr Gln Val Gly Ile Val Ser Ser Asp
245 250 255

Pro Leu Leu Asp Ala Thr Val His Ser Pro Arg Val Thr Ser Pro Gly
260 265 270

His Tyr His Asp Gly His Arg Gly Asp Arg His Gln Leu Arg Leu Gly
275 280 285

Gln Arg Arg His Tyr Pro Asp Ser Ser Glu Ser Ser Leu Arg Ala Ala
290 295 300

Ile Leu Pro Leu Glu Ser Ser Arg Ala Phe Ile Arg Arg Asn Gln Ser
305 310 315 320

Ser Phe Arg Gly Gly Leu Cys Gln Pro Pro Arg Phe Pro Thr Arg Thr
325 330 335

Val Pro Thr His Leu Pro Arg Arg Thr Leu Ala Ala Pro Pro Ser Glu
340 345 350

Glu Glu Glu Ala Pro Glu Lys Val Arg Val Val Glu Tyr
355 360 365

- 56 -

<210> 55

<211> 36

<212> PRT

<213> H. punctigera

<400> 55

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

Leu Ile Ser Ala
35

<210> 56

<211> 30

<212> PRT

<213> H. punctigera

<400> 56

Ile Val Gly Gly Ser Thr Ser Ser Val Gly Gln Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Ser Phe Ala Gly Gly Gln Ala Val Cys Gly
20 25 30

- 57 -

<210> 57
<211> 37
<212> PRT
<213> H. punctigera

<400> 57

Ile Val Gly Gly Ser Ile Thr Asp Ile Ala Asn Val Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val Cys Gly Ala Ser
20 25 30

Leu Ile Ser His Asn
35

<210> 58
<211> 37
<212> PRT
<213> H. punctigera

<400> 58

Ile Val Gly Gly Ser Ile Thr Asn Ile Ala Asn Val Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val Cys Gly Ala Ser
20 25 30

Leu Ile Ser His Asn
35

- 58 -

<210> 59

<211> 37

<212> PRT

<213> H. punctigera

<400> 59

Ile Val Gly Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Ser Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Val Arg
35

<210> 60

<211> 37

<212> PRT

<213> H. punctigera

<400> 60

Ile Val Gly Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Asn Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Gln Arg
35

- 59 -

<210> 61
<211> 37
<212> PRT
<213> H. punctigera

<400> 61

Ile Val Gly Gly Ser Ser Ala Ser Leu Gly Gln Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Ser Leu Ile Tyr Ser Gly Gln Ser Val Cys Gly Gly Ser Leu
20 25 30

Leu Asn Gln Arg Arg
35

<210> 62
<211> 37
<212> PRT
<213> H. punctigera

<400> 62

Ile Val Ala Gly Trp Pro Ala Val Glu Gly Gln Ile Pro Tyr Gln Gly
1 5 10 15

Ser Leu Arg Met Val Ser Ala Ile Gly Gly Val Ser Ser Cys Gly Cys
20 25 30

Ser Leu Ile His Asn
35

- 60 -

<210> 63

<211> 235

<212> PRT

<213> H. punctigera

<400> 63

Ile Val Gly Gly Ser Ile Thr Asp Ile Ala Asn Val Pro Tyr Gln Ala
 1 5 10 15

Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val Cys Gly Ala Ser
 20 25 30

Leu Ile Ser His Asn Arg Leu Val Thr Ala Ala His Cys Lys Ser Asp
 35 40 45

Gly Val Leu Thr Ala Asn Ser Phe Thr Val Val Leu Gly Ser Asn Thr
 50 55 60

Leu Phe Phe Gly Gly Thr Arg Ile Asn Thr Asn Asp Val Val Met His
 65 70 75 80

Pro Asn Trp Asn Pro Ser Thr Ala Ala Asn Asp Ile Ala Val Met Arg
 85 90 95

Ile Ser Ser Val Ser Phe Ser Asn Val Ile Gln Pro Ile Ala Leu Pro
 100 105 110

Ser Gly Asp Glu Leu Asn Asn Leu Phe Val Gly Ala Asn Ala Leu Ala
 115 120 125

- 61 -

Phe Gly Phe Gly Arg Thr Ser Asp Gly Gly Ser Ile Gly Ser Asn Gln
130 135 140

Gln Val Ser Ser Val Thr Ile Pro Val Ile Thr Asn Asp Glu Cys Ala
145 150 155 160

Ala Val Tyr Gly Ser Ala Phe Val His Ser Ser Asn Ile Cys Thr Ser
165 170 175

Gly Ala Gly Gly Lys Gly Thr Cys Asn Gly Asp Ser Gly Gly Pro Leu
180 185 190

Ala Ile Asp Ser Asn Asn Glu Lys Ile Leu Ile Gly Val Thr Ser Tyr
195 200 205

Gly Ala Gln Ala Gly Cys Ala Ala Gly Leu Pro Ala Ala Phe Ala Arg
210 215 220

Val Thr Ser Phe Val Ser Trp Val Gln Ser Gln
225 230 235

<210> 64

<211> 235

<212> PRT

<213> H. punctigera

<400> 64

Ile Val Gly Gly Ser Ile Thr Asn Ile Ala Asn Val Pro Tyr Gln Ala
1 5 10 15

- 62 -

Gly Leu Val Ile Thr Ile Phe Ile Phe Gln Ser Val Cys Gly Ala Ser
20 25 30

Leu Ile Ser His Asn Arg Leu Val Thr Ala Ala His Cys Lys Phe Asp
35 40 45

Gly Val Met Thr Ala Asn Ser Phe Thr Val Val Leu Gly Ser Asn Thr
50 55 60

Leu Phe Phe Gly Gly Thr Arg Ile Asn Thr Asn Asp Val Val Met His
65 70 75 80

Pro Asn Trp Asn Pro Ser Thr Val Ala Asn Asp Ile Ala Val Ile Arg
85 90 95

Ile Ser Ser Ile Val Tyr Asn Asn Val Ile Gln Pro Ile Ala Leu Pro
100 105 110

Ser Gly Asp Glu Leu Asp Asn Leu Phe Val Gly Ala Asn Ala Leu Ala
115 120 125

Ser Gly Phe Gly Arg Thr Ser Asp Ser Gly Gly Ile Gly Thr Asn Gln
130 135 140

Gln Leu Ser Ser Val Thr Ile Pro Val Ile Thr Asn Ala Glu Cys Ala
145 150 155 160

- 63 -

Ala Val Tyr Gly Pro Ala Phe Val His Asp Thr Asn Ile Cys Thr Ser
165 170 175

Gly Ala Gly Gly Lys Gly Thr Cys Asn Gly Asp Ser Gly Gly Pro Leu
180 185 190

Ala Val Asp Ser Asn Asp Lys Lys Ile Leu Ile Gly Val Thr Ser Tyr
195 200 205

Gly Ala Ala Asp Gly Cys Ala Ala Gly Phe Pro Ala Ala Phe Ala Arg
210 215 220

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Val Thr Ser Phe Val Ser Trp Val Gln Ser Gln
225                230                235
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<210>	65
<211>	234
<212>	PRT
<213>	H. punctigera

<400> 65

Ile Val Gly Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Ser Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Val Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

- 64 -

Gly Arg Asn Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg
50 55 60

Leu Tyr Ser Gly Gly Thr Arg Leu Asn Thr Ala Ser Val Val Met His
65 70 75 80

Gly Ser Trp Asn Pro Asn Leu Val Arg Asn Asp Ile Ala Met Ile Asn
85 90 95

Leu Pro Ser Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu
100 105 110

Pro Ser Gly Asn Glu Leu Asn Asn Gln Phe Ala Gly Ala Thr Ala Thr
115 120 125

Ala Ser Gly Phe Gly Leu Ala Arg Asp Gly Gly Val Ile Asp Gly Asn
130 135 140

Leu Arg His Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Ser Gln
145 150 155 160

Ser Phe Pro Gly Leu Ile Gln Ala Ser Asn Val Cys Thr Ser Gly Ala
165 170 175

Asn Gly Arg Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val
180 185 190

- 65 -

Asn Ser Asn Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser
195 200 205

Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Ser
210 215 220

Ser Tyr Ile Ser Trp Ile Asn Gln Arg Leu
225 230

<210> 66
<211> 234
<212> PRT
<213> H. punctigera

<400> 66

Ile Val Gly Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Asn Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Gln Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

Gly Arg Asn Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg
50 55 60

Leu Phe Ser Gly Gly Thr Arg Leu Asp Thr Ala Ser Val Val Met His
65 70 75 80

- 66 -

Gly Ser Trp Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Met Ile Asn
85 90 95

Leu Pro Ser Asn Val Ala Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu
100 105 110

Pro Ser Gly Asn Glu Leu Asn Asn Asn Phe Asn Gly Ala Thr Ala Thr
115 120 125

Ala Ser Gly Phe Gly Leu Ala Arg Asp Gly Gly Ser Val Asp Gly Asn
130 135 140

Leu Arg His Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys Thr Val
145 150 155 160

Ser Phe Pro Gly Ile Ile Gln Ser Ser Asn Ile Cys Thr Ser Gly Ala
165 170 175

Asn Gly Arg Ser Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val
180 185 190

Asn Ser Asn Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser
195 200 205

Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg Val Thr
210 215 220

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Ser Phe Ile Ser Trp Ile Asn Gln Arg Leu
225 230

<210> 67
<211> 282
<212> PRT
<213> H. punctigera

<400> 67

Ile Val Gly Gly Ser Ser Ala Ser Leu Gly Gln Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Ser Leu Ile Tyr Ser Gly Gln Ser Val Cys Gly Gly Ser Leu
20 25 30

Leu Asn Gln Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp Gly
35 40 45

Ile Val Ala Gly Trp Pro Ala Val Glu Gly Gln Ile Pro Tyr Gln Gly
50 55 60

Ser Leu Arg Met Val Ser Ala Ile Gly Gly Val Ser Ser Cys Gly Cys
65 70 75 80

Ser Leu Ile His Asn Lys Trp Val Leu Thr Ala Ala His Cys Leu Ala
85 90 95

Asn Arg Asn Gln Ala Thr Ser Leu Thr Val Ile Leu Gly Ser Ile Asn
100 105 110

- 68 -

Leu Phe Phe Gly Gly Thr Arg Leu Asn Ser Asn Ser Val Val Met His
115 120 125

Gly Ser Trp Asn Pro Asn Leu Ile Arg Asn Asp Ile Ala Ile Ile Asn
130 135 140

Leu Pro Ser Asn Val Gly Thr Ser Gly Asn Ile Ala Pro Ile Ala Leu
145 150 155 160

Pro Ser Gly Asn Glu Leu Asn Asn Gln Phe Ala Gly Phe Thr Ala Thr
165 170 175

Ala Ser Gly Phe Gly Leu Thr Arg Asp Gly Gly Asn Val Ser Pro Thr
180 185 190

Leu Asn His Val Asn Leu Pro Val Ile Thr Asn Asn Val Cys Trp Gln
195 200 205

Ser Phe Pro Leu Tyr Ile Gln Ser Thr Asn Ile Cys Thr Ser Gly Ala
210 215 220

Asn Gly Arg Gly Thr Cys Gln Gly Asp Ser Gly Gly Pro Leu Val Val
225 230 235 240

Thr Ser Asn Asn Arg Arg Ile Leu Ile Gly Val Thr Ser Phe Gly Ser
245 250 255

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Asp Arg Gly Cys Gln Val Gly Ala Pro Ala Ala Phe Ala Arg Val Thr
260 265 270

Ser Tyr Ile Ser Trp Ile Asn Gln Arg Leu
275 280

<210> 68
<211> 256
<212> PRT
<213> H. punctigera

<400> 68

Ile Val Ala Gly Trp Pro Ala Val Glu Gly Gln Ile Pro Tyr Gln Gly
1 5 10 15

Ser Leu Arg Met Val Ser Ala Ile Gly Gly Val Ser Ser Cys Gly Cys
20 25 30

Ser Leu Ile His Asn Lys Trp Val Leu Thr Ala Ala His Cys Leu Ala
35 40 45

Asn Arg Ile Thr Phe Val Val Arg Phe Gly Leu Thr Asn Leu Thr Arg
50 55 60

Pro Glu Ile Leu Val Glu Ser Thr Asn Lys Tyr Ile His Pro Glu Tyr
65 70 75 80

Asp Glu Ile Arg Ala Gly Val Gln Thr Ala Asp Leu Ala Leu Val Gly
85 90 95

- 70 -

Leu Asp His Glu Ile Glu Tyr Ser Ala Asn Val Gln Pro Ser Arg Leu
100 105 110

Met Ser Ser Ala Gln Lys Asn Ile Asn Tyr Glu Gly Ile Gln Met Ile
115 120 125

Val Ser Gly Phe Gly Arg Thr Asp Asp Leu Trp Asn Gly Gly Ala Ala
130 135 140

Ser Glu Ile Leu Leu Trp Val Tyr Gln Arg Gly Val Ser Asn Glu Glu
145 150 155 160

Cys Leu Arg Trp Tyr Pro Thr Ser Gln Val Ile Lys Glu Gln Thr Ile
165 170 175

Cys Ala Gly Tyr Trp Asp Asn Pro Ser Gln Ser Ser Cys Gln Gly Asp
180 185 190

Ser Gly Gly Pro Leu Thr Ile Ile Asp Ala Asp Gly Glu Arg Thr Gln
195 200 205

Ser Arg Tyr Cys Glu Leu Arg Ile His Cys Trp Asn Ala Thr Ala His
210 215 220

Ser Pro Gln Gly Tyr Val Arg Pro Gly His Tyr His Asp Trp Phe Thr
225 230 235 240

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Glu Val Thr Gly Ile Asn Phe Asp Trp Asp Ser Asp Ala Ile Ile Pro
245 250 255

<210> 69

<211> 236

<212> PRT

<213> H. punctigera

<400> 69

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

Leu Ile Ser Ala Ser Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

Gly Gln Asn Gln Ala Trp Arg Phe Thr Val Val Leu Gly Ser Thr Thr
50 55 60

Leu Phe Ser Gly Gly Thr Arg Ile Pro Thr Ser Asn Val Val Met His
65 70 75 80

Gly Ser Trp Thr Pro Ser Leu Ile Arg Asn Asp Val Ala Val Ile Arg
85 90 95

Leu Gly Thr Asn Val Ala Thr Ser Asn Thr Ile Ala Ile Ile Ala Leu
100 105 110

- 72 -

Pro Ser Gly Ser Gln Ile Asn Glu Asn Phe Ala Gly Glu Thr Ala Leu
115 120 125

Ala Ser Gly Phe Gly Leu Thr Ser Asp Thr Gly Ser Ile Ser Ser Asn
130 135 140

Gln Ala Leu Ser His Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys
145 150 155 160

Arg Asn Ser Phe Pro Leu Leu Ile Gln Asp Ser Asn Ile Cys Thr Ser
165 170 175

Gly Ala Asn Gly Arg Ser Thr Cys Arg Gly Asp Ser Gly Gly Pro Leu
180 185 190

Val Val Thr Arg Asn Asn Arg Pro Leu Leu Ile Gly Ile Thr Ser Phe
195 200 205

Gly Ser Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg
210 215 220

Val Thr Ser Tyr Ile Ser Trp Ile Asn Gly Gln Leu
225 230 235

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<210> 70

<211> 224

<212> PRT

<213> H. punctigera

<400> 70

Ile Val Gly Gly Tyr Thr Cys Glu Glu Asn Ser Leu Pro Tyr Gln Val
1 5 10 15

Ser Leu Asn Ser Gly Ser His Phe Cys Gly Gly Ser Leu Ile Ser Glu
20 25 30

Gln Trp Val Val Ser Ala Ala His Cys Tyr Lys Thr Arg Ile Gln Val
35 40 45

Arg Leu Gly Glu His Asn Ile Lys Val Leu Glu Gly Asn Glu Gln Phe
50 55 60

Ile Asn Ala Ala Lys Ile Ile Arg His Pro Lys Tyr Asn Arg Asp Thr
65 70 75 80

Leu Asp Asn Asp Ile Met Leu Ile Lys Leu Ser Ser Pro Ala Val Ile
85 90 95

Asn Ala Arg Val Ser Thr Ile Ser Leu Pro Thr Ala Pro Pro Ala Ala
100 105 110

Gly Thr Glu Cys Leu Ile Ser Gly Trp Gly Asn Thr Leu Ser Phe Gly
115 120 125

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Ala Asp Tyr Pro Asp Glu Leu Lys Cys Leu Asp Ala Pro Val Leu Thr
130 135 140

Gln Ala Glu Cys Lys Ala Ser Tyr Pro Gly Lys Ile Thr Asn Ser Met
145 150 155 160

Phe Cys Val Gly Phe Leu Glu Gly Gly Lys Asp Ser Cys Gln Arg Asp
165 170 175

Ser Gly Gly Pro Val Val Cys Asn Gly Gln Leu Gln Gly Val Val Ser
180 185 190

Trp Gly His Gly Cys Ala Trp Lys Asn Arg Pro Gly Val Tyr Thr Lys
195 200 205

Val Tyr Asn Tyr Val Asp Trp Ile Lys Asp Thr Ile Ala Ala Asn Ser
210 215 220

<210> 71

<211> 275

<212> PRT

<213> H. armigera

<400> 71

Val His Leu Glu Asp Ser Ile Asp Leu Glu Asp Ile Thr Ala Trp Gly
1 5 10 15

Tyr Leu Thr Lys Phe Gly Ile Pro Glu Ala Glu Lys Ile Arg Asn Ala
20 25 30

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Glu Glu Ala Ser Ser Ala Ser Arg Ile Val Gly Gly Ser Leu Ser Ser
35 40 45

Leu Gly Gln Ile Pro Tyr Gln Ala Gly Leu Val Ile Asp Leu Ser Gly
50 55 60

Gly Gln Ala Val Cys Gly Gly Ser Leu Ile Ser Ala Ser Arg Val Leu
65 70 75 80

Thr Ala Ala His Cys Trp Phe Asp Gly Gln Asn Gln Ala Trp Arg Phe
85 90 95

Thr Val Val Leu Gly Ser Thr Thr Leu Phe Ser Gly Gly Thr Arg Ile
100 105 110

Ala Thr Ser Asn Val Val Met His Gly Ser Trp Thr Pro Ser Leu Ile
115 120 125

Arg Asn Asp Val Ala Val Ile Arg Leu Gly Thr Asn Val Gly Thr Ser
130 135 140

Asn Thr Ile Ala Ile Ile Ala Leu Pro Ser Gly Ser Gln Ile Asn Glu
145 150 155 160

Asn Phe Ala Gly Glu Thr Ala Leu Ala Ser Gly Phe Gly Leu Thr Ser
165 170 175

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Asp Ser Gly Ser Ile Ser Ser Asn Gln Ala Leu Ser His Val Asn Leu
 180 185 190

Pro Val Ile Thr Asn Ala Val Cys Arg Ser Ser Phe Pro Leu Leu Ile
 195 200 205

Gln Asp Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg Ser Thr Cys
 210 215 220

Arg Gly Asp Ser Gly Gly Pro Leu Val Val Thr Arg Asn Ser Arg Pro
 225 230 235 240

Leu Leu Ile Gly Ile Thr Ser Phe Gly Ser Ala Arg Gly Cys Gln Val
 245 250 255

Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Tyr Ile Ser Trp Ile
 260 265 270

Asn Gly Gln
 275

<210> 72

<211> 275

<212> PRT

<213> H. punctigera

<400> 72

Val His Leu Glu Asp Ser Ile Asp Leu Glu Asp Ile Thr Ala Trp Gly
 1 5 10 15

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Tyr Leu Thr Lys Phe Gly Ile Pro Glu Ala Glu Lys Ile Arg Asn Ala
20 25 30

Glu Glu Ala Ser Ser Ala Ser Arg Ile Val Gly Gly Ser Leu Ser Ser
35 40 45

Leu Gly Gln Ile Pro Tyr Gln Ala Gly Leu Val Ile Asp Leu Ala Gly
50 55 60

Gly Gln Ala Val Cys Gly Gly Ser Leu Ile Ser Ala Ser Arg Val Leu
65 70 75 80

Thr Ala Ala His Cys Trp Phe Asp Gly Gln Asn Gln Ala Trp Arg Phe
85 90 95

Thr Val Val Leu Gly Ser Thr Thr Leu Phe Ser Gly Gly Thr Arg Ile
100 105 110

Pro Thr Ser Asn Val Val Met His Gly Ser Trp Thr Pro Ser Leu Ile
115 120 125

Arg Asn Asp Val Ala Val Ile Arg Leu Gly Thr Asn Val Gly Thr Ser
130 135 140

Asn Thr Ile Ala Ile Ile Ala Leu Pro Ser Gly Ser Gln Ile Asn Glu
145 150 155 160

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Asn Phe Ala Gly Glu Thr Ala Leu Ala Ser Gly Phe Gly Leu Thr Ser
165 170 175

Asp Thr Gly Ser Ile Ser Ser Asn Gln Ala Leu Ser His Val Asn Leu
180 185 190

Pro Val Ile Thr Asn Ala Val Cys Arg Asn Ser Phe Pro Leu Leu Ile
195 200 205

Gln Asp Ser Asn Ile Cys Thr Ser Gly Ala Asn Gly Arg Ser Thr Cys
210 215 220

Arg Gly Asp Ser Gly Gly Pro Leu Val Val Thr Arg Asn Asn Arg Pro
225 230 235 240

Leu Leu Ile Gly Ile Thr Ser Phe Gly Ser Ala Arg Gly Cys Gln Val
245 250 255

Gly Ser Pro Ala Ala Phe Ala Arg Val Thr Ser Tyr Ile Ser Trp Ile
260 265 270

Asn Gly Gln
275

- 79 -

<210> 73

<211> 230

<212> PRT

<213> H. punctigera

<400> 73

Ile Val Asn Gly Glu Asp Ala Val Pro Gly Ser Trp Pro Trp Gln Val
1 5 10 15

Ser Leu Gln Asp Ser Thr Gly Phe His Phe Cys Gly Gly Ser Leu Ile
20 25 30

Ser Glu Asp Trp Val Val Thr Ala Ala His Cys Gly Val Thr Thr Ser
35 40 45

Asp Val Val Val Ala Gly Glu Phe Asp Gln Gly Ser Ser Ser Glu Lys
50 55 60

Ile Gln Lys Leu Lys Ile Ala Lys Val Phe Lys Asn Ser Lys Tyr Asn
65 70 75 80

Ser Leu Thr Ile Asn Asn Asp Ile Thr Leu Leu Lys Leu Ala Thr Pro
85 90 95

Ala Gln Phe Ser Glu Thr Val Ser Ala Val Cys Leu Pro Ser Ala Asp
100 105 110

Glu Asp Phe Pro Ala Gly Met Leu Cys Ala Thr Thr Gly Trp Gly Lys
115 120 125

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Thr Lys Tyr Asn Ala Leu Lys Thr Pro Asp Lys Leu Gln Gln Ala Thr
 130 135 140

Leu Pro Ile Val Ser Asn Thr Asp Cys Arg Lys Tyr Trp Gly Ser Arg
 145 150 155 160

Val Thr Asp Val Met Ile Cys Ala Gly Ala Ser Gly Val Ser Ser Cys
 165 170 175

Met Gly Asp Ser Gly Gly Pro Leu Val Cys Gln Lys Asn Gly Ala Trp
 180 185 190

Thr Leu Ala Gly Ile Val Ser Trp Gly Ser Ser Thr Cys Ser Thr Ser
 195 200 205

Thr Pro Ala Val Tyr Ala Arg Val Thr Ala Leu Met Pro Trp Val Gln
 210 215 220

Glu Thr Leu Ala Ala Asn
 225 230

<210> 74

<211> 230

<212> PRT

<213> H. punctigera

<400> 74

Ile Val Asn Gly Glu Glu Ala Val Pro Gly Ser Trp Pro Trp Gln Val
 1 5 10 15

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Ser Leu Gln Asp Lys Thr Gly Phe His Phe Cys Gly Gly Ser Leu Ile
20 25 30

Asn Glu Asn Trp Val Val Thr Ala Ala His Cys Gly Val Thr Thr Ser
35 40 45

Asp Val Val Val Ala Gly Glu Phe Asp Gln Gly Leu Glu Thr Glu Asp
50 55 60

Thr Gln Val Leu Lys Ile Gly Lys Val Phe Lys Asn Pro Lys Phe Ser
65 70 75 80

Ile Leu Thr Val Arg Asn Asp Ile Thr Leu Leu Lys Leu Ser Thr Ala
85 90 95

Ala Ser Phe Ser Gln Thr Val Ser Ala Val Cys Leu Pro Ser Ala Ser
100 105 110

Asp Asp Phe Ala Ala Gly Thr Thr Cys Val Thr Thr Gly Trp Gly Leu
115 120 125

Thr Arg Tyr Thr Asn Ala Asn Thr Pro Asp Arg Leu Gln Gln Ala Ser
130 135 140

Leu Pro Leu Leu Ser Asn Thr Asn Cys Lys Lys Tyr Trp Gly Thr Lys
145 150 155 160

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Ile Lys Asp Ala Met Ile Cys Ala Gly Ala Ser Gly Val Ser Ser Cys
165 170 175

Met Gly Asp Ser Gly Gly Pro Leu Val Cys Lys Gln Asn Gly Ala Trp
180 185 190

Thr Leu Val Gly Ile Val Ser Trp Gly Ser Ser Thr Cys Ser Thr Ser
195 200 205

Thr Pro Gly Val Tyr Ala Arg Val Thr Ala Leu Val Asn Trp Val Gln
210 215 220

Gln Thr Leu Ala Ala Asn
225 230

<210> 75

<211> 237

<212> PRT

<213> H. punctigera

<400> 75

Ile Val Gly Gly Ser Thr Ser Ser Leu Gly Ala Phe Pro Tyr Gln Ala
1 5 10 15

Gly Leu Leu Ala Ser Phe Ala Ser Gly Gln Gly Val Cys Gly Gly Ser
20 25 30

Leu Leu Asn Val Arg Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

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Gly Arg Asn Gln Ala Arg Ser Phe Thr Val Val Leu Gly Ser Val Arg
50 55 60

Leu Tyr Ser Gly Gly Thr Arg Leu Asn Thr Ala Ser Val Val Met His
65 70 75 80

Gly Ser Trp Asn Pro Asn Leu Val Arg Thr Ile Asn Asn Asp Ile Ala
85 90 95

Met Ile Asn Leu Pro Ser Asn Val Ala Thr Ser Gly Asn Ile Ala Pro
100 105 110

Ile Ala Leu Pro Ser Gly Asn Glu Leu Asn Asn Gln Phe Ala Gly Ala
115 120 125

Thr Ala Thr Ala Ser Gly Phe Gly Leu Ala Arg Asp Gly Gly Val Ile
130 135 140

Asp Gly Asn Leu Arg His Val Asn Leu Pro Val Ile Thr Asn Ala Val
145 150 155 160

Cys Ser Gln Ser Phe Pro Gly Leu Ile Gln Ala Ser Asn Val Cys Thr
165 170 175

Ser Gly Ala Asn Gly Arg Ser Thr Cys Gln Gly Gly Asp Ser Gly Gly
180 185 190

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Pro Leu Val Asn Ser Asn Asn Arg Arg Ile Leu Ile Gly Val Thr Ser
195 200 205

Phe Gly Ser Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala
210 215 220

Arg Val Ser Ser Tyr Ile Ser Trp Ile Asn Gln Arg Leu
225 230 235

<210> 76

<211> 236

<212> PRT

<213> H. punctigera

<400> 76

Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln Ala
1 5 10 15

Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly Ser
20 25 30

Leu Leu Ser Ala Ser Arg Val Leu Thr Ala Ala His Cys Trp Phe Asp
35 40 45

Gly Gln Asn Gln Ala Trp Arg Phe Thr Val Val Leu Gly Ser Thr Thr
50 55 60

Leu Phe Ser Gly Gly Thr Arg Leu Asn Ile Pro Ser Ser Asn Met His
65 70 75 80

- 85 -

Gly Ser Trp Asn Pro Ser Leu Ile Arg Asn Asp Val Ala Val Ile Arg
85 90 95

Leu Gly Thr Asn Val Ala Thr Ser Asn Thr Ile Ala Ile Ile Ala Leu
100 105 110

Pro Ser Gly Ser Gln Ile Asn Glu Asn Phe Ala Gly Glu Thr Ala Leu
115 120 125

Ala Ser Gly Phe Gly Leu Thr Ser Tyr Thr Gly Ser Ile Ser Ser Asn
130 135 140

Gln Ala Leu Ser His Val Asn Leu Pro Val Ile Thr Asn Ala Val Cys
145 150 155 160

Arg Asn Ser Phe Ser Leu Leu Ile Gln Asp Ser Asn Ile Cys Thr Ser
165 170 175

Gly Ala Asn Gly Arg Ser Thr Cys Arg Gly Asp Ser Gly Gly Pro Leu
180 185 190

Val Val Thr Arg Asn Asn Arg Pro Leu Leu Ile Gly Val Thr Ser Phe
195 200 205

Gly Ser Ala Arg Gly Cys Gln Val Gly Ser Pro Ala Ala Phe Ala Arg
210 215 220

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Val Thr Ser Tyr Ile Ser Trp Ile Asn Gly Gln Leu
225 230 235

<210> 77

<211> 107

<212> PRT

<213> peptide

<400> 77

Met Glu Ser Lys Phe Ala His Ile Ile Val Phe Phe Leu Leu Ala Thr
1 5 10 15

Ser Phe Glu Thr Leu Met Ala Arg Lys Glu Ser Asp Gly Pro Glu Val
20 25 30

Ile Glu Leu Leu Lys Glu Phe Glu Cys Asn Gly Lys Gln Phe Trp Pro
35 40 45

Glu Leu Ile Gly Val Pro Thr Lys Leu Ala Lys Glu Ile Ile Glu Lys
50 55 60

Glu Asn Ser Leu Ile Asn Asn Val Gln Ile Leu Leu Asn Gly Ser Pro
65 70 75 80

Val Thr Met Asp Tyr Arg Cys Asn Arg Val Arg Leu Phe Asp Asn Ile
85 90 95

Leu Gly Ser Val Val Gln Ile Pro Arg Val Ala
100 105

- 87 -

<210> 78

<211> 107

<212> PRT

<213> peptide

<400> 78

Met Glu Ser Lys Phe Ala His Ile Ile Val Phe Phe Leu Leu Ala Thr
1 5 10 15

Ser Phe Glu Thr Leu Leu Ala Arg Lys Glu Ser Asp Gly Pro Glu Val
20 25 30

Ile Glu Leu Leu Lys Glu Phe Glu Cys Asn Gly Lys Gln Phe Trp Pro
35 40 45

Glu Leu Ile Gly Val Pro Thr Lys Leu Ala Lys Glu Ile Ile Glu Lys
50 55 60

Glu Asn Ser Leu Ile Asn Asn Val Gln Ile Leu Leu Asn Gly Ser Pro
65 70 75 80

Val Ala Met Asp Tyr Arg Cys Asn Arg Val Arg Leu Phe Asp Asn Ile
85 90 95

Leu Gly Ser Val Val Gln Ile Pro Arg Val Ala
100 105

- 88 -

<210> 79

<211> 71

<212> PRT

<213> peptide

<400> 79

Lys Glu Phe Glu Cys Asp Gly Lys Leu Gln Trp Pro Glu Leu Ile Gly
1 5 10 15

Val Pro Thr Lys Leu Ala Lys Glu Ile Ile Glu Lys Gln Asn Ser Leu
20 25 30

Ile Ser Asn Val His Ile Leu Leu Asn Gly Ser Pro Val Thr Met Asp
35 40 45

Phe Arg Cys Asn Arg Val Arg Leu Phe Asp Asp Ile Leu Gly Ser Val
50 55 60

Val Gln Ile Pro Arg Val Ala
65 70

<210> 80

<211> 106

<212> PRT

<213> peptide

<400> 80

Met Glu Ser Lys Phe Ala His Ile Ile Val Phe Phe Leu Leu Ala Thr
1 5 10 15

- 89 -

Ser Phe Glu Thr Leu Leu Ala Arg Lys Glu Ser Asp Gly Pro Glu Val
20 25 30

Ile Glu Leu Gln Lys Glu Phe Glu Cys Asn Gly Lys Gln Arg Trp Pro
35 40 45

Glu Leu Ile Gly Val Pro Thr Lys Leu Ala Lys Gly Ile Ile Glu Lys
50 55 60

Glu Asn Ser Leu Ile Thr Asn Val Gln Ile Leu Leu Asn Gly Ser Pro
65 70 75 80

Val Thr Met Asp Tyr Arg Ser Asn Arg Val Arg Leu Phe Asp Asn Ile
85 90 95

Leu Gly Asp Val Val Gln Ile Pro Arg Val
100 105

<210> 81

<211> 111

<212> PRT

<213> peptide

<400> 81

Met Glu Ser Lys Phe Ala His Ile Ile Val Phe Phe Leu Leu Ala Thr
1 5 10 15

Ser Phe Glu Thr Leu Met Ala Arg Lys Glu Gly Asp Gly Ser Glu Val
20 25 30

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Ile Lys Leu Leu Lys Glu Ser Glu Ser Glu Ser Trp Cys Lys Gly Lys
35 40 45

Gln Phe Trp Pro Glu Leu Ile Gly Val Pro Thr Lys Leu Ala Lys Glu
50 55 60

Ile Ile Glu Lys Glu Asn Pro Ser Ile Asn Asp Val Pro Ile Ile Leu
65 70 75 80

Asn Gly Thr Pro Val Pro Ala Asp Phe Arg Cys Asn Arg Val Arg Leu
85 90 95

Phe Asp Asn Ile Leu Gly Asp Val Val Gln Ile Pro Arg Val Ala
100 105 110

<210> 82

<211> 111

<212> PRT

<213> peptide

<400> 82

Met Glu Ser Lys Phe Ala His Ile Ile Val Phe Phe Leu Leu Ala Thr
1 5 10 15

Ser Phe Glu Thr Leu Met Ala Arg Lys Glu Ile Asp Gly Pro Glu Val
20 25 30

Ile Glu Leu Leu Lys Glu Phe Asp Ser Asn Leu Met Cys Glu Gly Lys
35 40 45

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Gln Met Trp Pro Glu Leu Ile Gly Val Pro Thr Lys Leu Ala Lys Glu
50 55 60

Ile Ile Glu Lys Glu Asn Pro Ser Ile Thr Asn Ile Pro Ile Leu Leu
65 70 75 80

Ser Gly Ser Pro Ile Thr Leu Asp Tyr Leu Cys Asp Arg Val Arg Leu
85 90 95

Phe Asp Asn Ile Leu Gly Phe Val Val Gln Met Pro Val Val Thr
100 105 110

<210> 83

<211> 107

<212> PRT

<213> peptide

<400> 83

Met Val Lys Phe Ala His Val Val Ala Phe Leu Leu Leu Ala Ser Leu
1 5 10 15

Ile Gln Pro Leu Thr Ala Arg Asp Leu Glu Ile Asn Val Leu Gln Leu
20 25 30

Asp Val Ser Gln Ser Gly Cys Pro Gly Val Thr Lys Glu Arg Trp Pro
35 40 45

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Glu Leu Leu Gly Thr Pro Ala Lys Phe Ala Met Gln Ile Ile Gln Lys
50 55 60

Glu Asn Pro Lys Leu Thr Asn Val Gln Thr Ile Leu Asn Gly Gly Pro
65 70 75 80

Val Thr Glu Asp Leu Arg Cys Asn Arg Val Arg Leu Phe Val Asn Val
85 90 95

Leu Asp Phe Ile Val Gln Thr Pro Gln Ile Gly
100 105

<210> 84

<211> 73

<212> PRT

<213> peptide

<400> 84

Met Ser Ser Thr Glu Cys Gly Gly Gly Gly Gly Gly Ala Lys Thr Ser
1 5 10 15

Trp Pro Glu Val Val Gly Leu Ser Val Glu Asp Ala Lys Lys Val Ile
20 25 30

Leu Lys Asp Lys Pro Asp Ala Asp Ile Val Val Leu Pro Val Gly Ser
35 40 45

Val Val Thr Ala Asp Tyr Arg Pro Asn Arg Val Arg Ile Phe Val Asp
50 55 60

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Ile Val Ala Gln Thr Pro His Ile Gly
65 70

<210> 85

<211> 70

<212> PRT

<213> peptide

<400> 85

Thr Glu Phe Gly Ser Glu Leu Lys Ser Phe Pro Glu Val Val Gly Lys
1 5 10 15

Thr Val Asp Gln Ala Arg Glu Tyr Phe Thr Leu His Tyr Pro Gln Tyr
20 25 30

Asp Val Tyr Phe Leu Pro Glu Gly Ser Pro Val Thr Leu Asp Leu Arg
35 40 45

Tyr Asn Arg Val Arg Val Phe Tyr Asn Pro Gly Thr Asn Val Val Asn
50 55 60

His Val Pro His Val Gly
65 70

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<210> 86

<211> 60

<212> DNA

<213> peptide

<400> 86

ggatccatga aactcttggc tgtgactcta ttggctttcg ccgcggtcgt ctccgcgagg 60

<210> 87

<211> 18

<212> PRT

<213> peptide

<400> 87

Met	Lys	Leu	Leu	Ala	Val	Thr	Leu	Leu	Ala	Phe	Ala	Ala	Val	Val	Ser
1				5					10					15	

Ala Arg

<210> 88

<211> 40

<212> DNA

<213> artificial sequence

<220>

<223> FwBacRECH2 primer

<400> 88

ggatccatga aactcttggc tgtgactcta ttggctttcg 40

- 95 -

<210> 89
 <211> 40
 <212> DNA
 <213> artificial sequence

<220>
 <223> FwBacRECH2 primer

<400> 89
 ttggcctttcg ccgcggtcgt ctccgcgagg aacgggtccc 40

<210> 90
 <211> 864
 <212> DNA
 <213> peptide

<400> 90
 aacggatccc accatcacca tcaccatggt cacctcgagg attctattga tctggaagat 60
 attaccgctt ggggatacct caccaaattc ggtattccag aagctgagaa aatccgcaac 120
 gctgaagaag ctagctctgc tagcaggatc gtcgggtggt cattgtccag tgtcggacag 180
 atcccttacc aggctgggtc cgtcattgac ttagcagggt gccaggctgt ctgcggaggc 240
 tccctgatca gcgcttcccg cgtactgacc gctgctcact gctgggtcga cggccaaaac 300
 caggcctgga gattcacctg tgttcttggg tccaccacct tgttctctgg cggtagcaga 360
 atccctacat ccaatgttgt tatgcacgga agctggactc ctagccttat ccgtaacgat 420
 gttgccgtaa tcagattggg caccaacgta gcaacctcaa acaccattgc catcatcgct 480
 ctaccacgcg gcagccagat caacgagaac ttcgccggtg aaaccgccct cgcctccggc 540
 ttcggtctca ccagtgaac cggcagcatc tccagcaacc aggctctgag ccacgtcaac 600

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ctgccagtga tcaccaacgc tgtgtgcaga aattcattcc ccctgctgat ccaggactct 660
 aacatttgca ccagcgggtgc caacggcagg agcacttgcc gcgggtgactc cggcgggtcct 720
 ctcgtcgtca ccaggaacaa cagaccactc ttgatcggtg taacctcttt cggatctgcc 780
 cgcggttgcc aagttggatc tcccgtgcc ttcgccagag tcacctctta catcagctgg 840
 atcaacggcc agctctaaaa gctt 864

<210> 91
 <211> 287
 <212> PRT
 <213> peptide

<400> '91

Asn Gly Ser His His His His His His Val His Leu Glu Asp Ser Ile
 1 5 10 15

Asp Leu Glu Asp Ile Thr Ala Trp Gly Tyr Leu Thr Lys Phe Gly Ile
 20 25 30

Pro Glu Ala Glu Lys Ile Arg Asn Ala Glu Glu Ala Ser Ser Ala Ser
 35 40 45

Arg Ile Val Gly Gly Ser Leu Ser Ser Val Gly Gln Ile Pro Tyr Gln
 50 55 60

Ala Gly Leu Val Ile Asp Leu Ala Gly Gly Gln Ala Val Cys Gly Gly
 65 70 75 80

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Ser Leu Ile Ser Ala Ser Arg Val Leu Thr Ala Ala His Cys Trp Phe
85 90 95

Asp Gly Gln Asn Gln Ala Trp Arg Phe Thr Val Val Leu Gly Ser Thr
100 105 110

Thr Leu Phe Ser Gly Gly Thr Arg Ile Pro Thr Ser Asn Val Val Met
115 120 125

His Gly Ser Trp Thr Pro Ser Leu Ile Arg Asn Asp Val Ala Val Ile
130 135 140

Arg Leu Gly Thr Asn Val Ala Thr Ser Asn Thr Ile Ala Ile Ile Ala
145 150 155 160

Leu Pro Ser Gly Ser Gln Ile Asn Glu Asn Phe Ala Gly Glu Thr Ala
165 170 175

Leu Ala Ser Gly Phe Gly Leu Thr Ser Asp Thr Gly Ser Ile Ser Ser
180 185 190

Asn Gln Ala Leu Ser His Val Asn Leu Pro Val Ile Thr Asn Ala Val
195 200 205

Cys Arg Asn Ser Phe Pro Leu Leu Ile Gln Asp Ser Asn Ile Cys Thr
210 215 220

Ser Gly Ala Asn Gly Arg Ser Thr Cys Arg Gly Asp Ser Gly Gly Pro
225 230 235 240

- 98 -

Leu Val Val Thr Arg Asn Asn Arg Pro Leu Leu Ile Gly Ile Thr Ser
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